APPENDIX E

Income Budget Analysis and Results

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Appendix E

Income Budget Analysis and Results

1.0 Budgeting Analysis

To more clearly assess regulatory impacts on an individual unit of production for a given commodity and region, a budgetinq analysis was used. Baseline conditions were defined as net returns to management and land for one acre of production prior to any regulatory action. These conditions were calculated from regional production cost and yield estimates and national price estimates. Total production cost estimates were obtained from crop enterprise budgets compiled by the USDA Cooperative Extension Service in each appropriate state. Crop enterprise budgets typically categorize total costs as variable and fixed. Variable costs are those which vary according to the level of production. Fixed costs are those which (in the short run) are unrelated to production levels.

Enterprise budgets vary in their treatment of expensing the cost of owner provided inputs. For this study, the cost of owner provided land and management were excluded. Any net returns would then be attributable to these factors of production. To the extent possible, all budgets were adjusted to be comparable. In instances where a production region consisted of two or more states (e.g., Idaho and Washington potatoes) a production weighted total cost of production was calculated. All costs were adjusted by the Index of Prices Paid by Farmers to reflect 1986 dollars.

The baseline-conditions were then adjusted by the cost and yield impact estimates and the national price change estimates (developed from the national price-quantity model and adjusted for regional differences) to estimate the post-impact net returns per acre for each regulatory scenario by region and crop. It is expected net returns per acre will typically decrease from the influence of regulatory impacts because of:

1. increased variable costs per acre of production, and
2. decreases in yield which lowers production and thus lowers revenue per acre.

Ameliorating these negative effects on net revenue would be an increase in price caused by a national decline in supply due to decreased production nationwide.

Algebraically, the farm income budgeting model can be expressed as:

$$NR_i = NR_o + dTR - dC.$$

Since TR is dependent on price and production,

$$dTR = P_iQ_i - P_oQ_o.$$

Thus,

$$NR_i = NR_o + P_iQ_i - P_oQ_o - d\,C\,.$$

Where:

NR_i = Net returns per acre of commodity production after the regulatory scenario,

NR_o = Net returns per acre or commodity production before the regulatory scenario,

dTR = change in total revenue,

dC = change in total costs,

P_i = commodity price after the regulatory scenario,

P_O = commodity baseline price

Q_i = commodity production per acre after the regulatory scenario, and

Q_o = commodity production per acre under baseline conditions.

2.0 Data Inputs

Production cost estimates and baseline net returns for each specialty crop production region (Table E-l) along with an estimate of an average price and production (Appendix C, Table C-l) were required to complete this analysis. Regional estimates of average and maximum variable cost and yield changes associated with environmental regulations for each specialty crop under each scenario were provided by EPA. First year production cost and yield changes are presented in Tables E-2 through E-5.

3.0 Model Results

Regulatory impacts on net returns which consider effects on product price, quantity of production and production costs are presented graphically in Figures E-l through E-9. Average and maximum impacts are measured from a baseline net return (no regulatory impact) for each of the specialty crops under the three policy scenarios.

Table E-1.
Base line production costs and net returns

Crop/Region	Per acre production costs Variable costs	Fixed costs	Total costs	Baseline net returns
		(1986$)		
Irish Potatoes				
ID - WA	983.14	229.22	1,212.36	606.00
ND - MN	332.90	235.19	568.09	243.00
ME	762.67	149.88	912.55	134.00
Green Peas				
WI	132.35	47.20	179.55	197.00
WA	245.81	59.68	314.49	78.00
Apples				
WA	2,593.41	897.66	3,491.07	327.00
NY	1,785.00	162.07	1,947.07	217.00
MI	1,112.70	544.44	1,657.14	76.00
Peanuts 1/				
GA - AL	322.16	126.84	449.00	286.00
NC - VA	338.65	185.98	524.63	386.00
TX - OK	222.27	88.99	311.26	186.00
Caneberries (Red Raspberries)				
WA	3,274.21	1,588.81	4,863.02	NA
OR	3,962.45	1,922.78	5,885.23	NA
Tomatoes				
FL (Fresh)	6,310.31	351.59	6,661.90	1,510.00
CA (Processing)	1,092.05	174.50	1,266.55	659.00

1/ Net returns are for additional peanuts. Net returns for quota peanuts are $298, $444 and $206 for GA-AL, NC-VA and TX-OK, respectively.

Source: Crop enterprise budgets from the individual states.

Table E-2
Potential Impacts for Selected Apple Producers

Variable Cost: First Year Impact

Scenario	Action	Region	Cost 1/	Yield(%)	Acres(%)
1-3	Farm Worker Safety	WA	5.40	0	90
		NY	5.40	0	90
		MI	5.40	0	90
1	Organophosphates Plan I	WA	2.00	0	86
		NY	2.00	0	100
		MI	2.00	0	100
2	Organophosphates Plan II	WA	25.08	0	62
		NY	14.38	0	75
		MI	14.38	0	75
3	Organophosphates Plan III	WA	33.08	-2	86
		NY	9.39	-2	100
		MI	9.39	-2	100
1	Groundwater Plan I	WA	0.0	0	0
		NY	0.0	0	0
		MI	0.0	0	0
2	Groundwater Plan II	WA	11.83	0	5
		NY	10.90	0	10
		MI	10.90	0	10
3	Groundwater Plan II	WA	11.83	0	25
		NY	10.90	0	45
		MI	10.90	0	45
1	Fungicides Plan I	WA	0.0	0	0
		NY	0.0	0	0
		MI	0.0	0	0
2	Fungicides Plan II	WA	0.0	0	0
		NY	-13.06	-20	83
		MI	-13.06	-20	58
3	Fungicides Plan II	WA	0.0	0	0
		NY	-13.06	-20	83
		MI	-13.06	-20	58

Continued...

Table E-2 (continued)

Fixed costs:

Scenario	Action	Impact
l-3	SARA Title III Section 302-304	cost = $50/covered farm. Assumed l/3 of all farms covered.
l-3	Enclosed Cabs	Cost = $2,500. Assumed l/3 of all cabs must be enclosed.
l-3	Underground Storage Tanks	Some farms may incur costs due to Underground Storage Tank regulations, however, due to the significant amount of uncertainty as to whether specialty crop farms would have covered UST's. These costs were not included.
3	Lead Phasedown	Under a total ban of lead in gasoline for agricultural use, farmers having gasoline powered tractors, combines, and trucks may incur a cost to rebuild the valves. This cost would be approximately $1,000 for a combine and a truck, and $750 for a tractor. These costs were not included in the budget analyses for apple producers.

1/ Cost per acre (1986$)

Table E-3
Potential Impacts for Selected Potato Producers

Variable Cost: First Year Impacts

Scenario	Action	Region	Cost 1/	Yield(%)	Acres(%)
1-3	EDB Cancellation	WA/ID	16.80	0	2.2
		MN/ND	18.48	0	1.1
		ME	18.48	0	1.1
1-3	Dinoseb Cancellation	WA/ID	8.51	0	50.0
		MN/ND	8.51	0	50.0
		ME	8.51	0	50.0
l-3	Farm Worker Safety	WA/ID	1.43	0	90.0
		MN/ND	1.43	0	90.0
		ME	1.43	0	90.0
1	Groundwater Plan I	WA/ID	0.00	0	0.0
		MN/ND	10.00	0	3.5
		ME	11.00	0	1.9
2	Groundwater Plan II	WA/ID	0.00	0	0.0
		MN/ND	10.00	0	3.5
		ME	11.00	0	1.9
3	Groundwater Plan III	WA/ID	39.13	0	12.4
		MN/ND	10.00	0	14.6
		ME	11.00	0	7.5
1	Organophosphates Plan I	WA/ID	1.00	0	74.0
		MN/ND	1.00	0	74.0
		ME	1.00	0	74.0
2	Organophosphates Plan II	WA/ID	5.88	0	68.0
		MN/ND	5.88	0	68.0
		ME	5.88	0	68.0
3	Organophosphates Plan III	WA/ID	7.00	-8	74.0
		MN/ND	7.00	-8	74.0
		ME	7.00	-8	74.0
1	Fungicides I	WA/ID	0.00	0	0.0
		MN/ND	0.00	0	0.0
		ME	0.00	0	0.0
2	Fungicides II	WA/ID	8.81	0	7.0
		MN/ND	6.61	0	54.0
		ME	11.05	0	80.0

Continued.

Table E-3 (continued)

3	Fungicides III	WA/ID	-0.60	-8	12.0
		MN/ND	-0.45	-8	80.0
		ME	-0.75	-8	80.0

Fixed costs:

Scenario	Action	Impact
1-3	SARA Title III Section 302-304	cost = $50/covered farm. Assumed l/3 of all farms covered.
l-3	Enclosed Cabs	cost = $2,500. Assumed l/3 of all cabs must be enclosed.
l-3	Underground Storage Tanks	Some farms may incur costs due to Underground Storage Tank-regulations, however, due to the significant amount of uncertainty as to whether specialty crop farms would have covered UST's. These costs were not included.
3	Lead Phasedown	Under a total ban of lead in gasoline for agricultural use, farmers having gasoline powered tractors, combines, and trucks may incur a cost to rebuild the valves. This cost would be approximately $1,000 for a combine and a truck, and $750 for a tractor. These costs were not included in the budget analyses for potato producers.

1/ Cost per acre (1986$)

Table E-3
Potential Impacts for Selected Pea Producers

Variable Costs: First Year Impacts

Scenario	Action	Region	Cost 1/	Yield(%)	Acres(%)
1-3	Dinoseb Cancellation	WA	10.40	0	75
		WI	0.00	0	0
1-3	Farm Worker Safety	WA	0.86	0	90
		WI	0.86	0	90
1	Organophosphates Plan I	WA	1.00	0	30
		WI	1.00	0	30
2	Organophosphates Plan II	WA	2.92	0	30
		WI	2.92	0	30
3	Organophosphates Plan III	WA	3.08	0	35
		WI	3.08	0	35

Fixed costs:

Scenario	Action	Impact
1-3	SARA Title III Section 302-304	cost = $50/covered farm. Assumed 1/3 of all farms covered.
1-3	Enclosed Cabs	Cost = $2,500. Assumed 1/3 of all cabs must be enclosed.
1-3	Underground Storage Tanks	Some farms may incur costs due to Underground Storage Tank regulations, however, due to the significant amount of uncertainty as to whether specialty crop farms would have covered UST's. These costs were not included.

Continued...

Table E-4 (continued)

Lead Phasedown	Under a total ban of lead in gasoline for agricultural use, farmers having gasoline powered tractors, combines, and trucks may incur a cost to rebuild the valves. This cost would be approximately $1,000 for a combine and a truck, and $750 for a tractor. These costs were not included in the budget analyses for pea producers.

1/ Cost per acre (1986$)

Table E-5
Potential Impacts for Selected Tomato Producers

Variable Costs: First Year Impacts

Scenario	Action	Region	Cost 1/	Yield(%)	Acres(%)
1-3	EDB Cancellation	CA	22.65	0	2.9
		FL	22.65	0	2.9
1-3	Farm Worker Safety	CA	7.50	0	90.0
		FL	7.50	0	90.0
1	Fungicides Plan I	CA	0.00	0	0.0
		FL	0.00	0	0.0
2	Fungicides Plan II	CA	1.50	0	9.0
		FL	20.93	0	77.0
3	Fungicides Plan III	CA	-3.39	-20	25.0
		FL	-20.34	-20	98.0

Fixed costs:

Scenario	Action	Impact
1-3	SARA Title III Section 302-304	cost = $50/covered farm. Assumed 1/3 of all farms covered.
1-3	Enclosed Cabs	cost = $2,500. Assumed 1/3 of all cabs must be enclosed.
1-3	Underground Storage Tanks	Some farms may incur costs due to Underground Storage Tank regulations, however, due to the significant amount of uncertainty as to whether specialty crop farms would have covered UST's. These costs were not included.

Continued...

Table E-5 (continued)

3	Lead Phasedown	Under a total ban of lead in gasoline for agricultural use, farmers having gasoline powered tractors, combines, and trucks may incur a cost to rebuild the valves. This cost would be approximately $1,000 for a combine and a truck, and $750 for a tractor. These costs were not included in the budget analyses for tomato producers.

1/ Cost per acre (1986$)

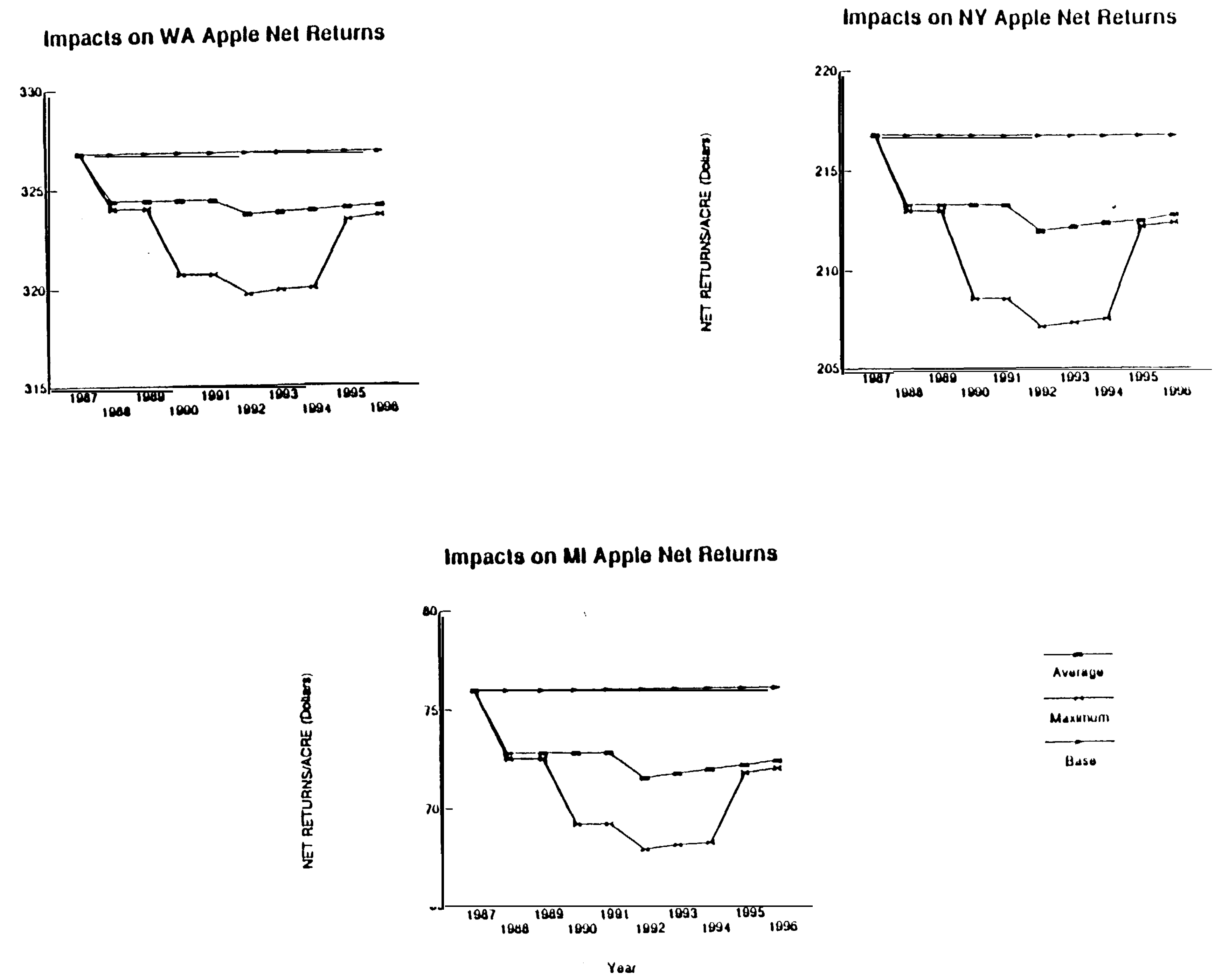


Figure E-1 Scenario 1, egulatory impacts on apple net returns

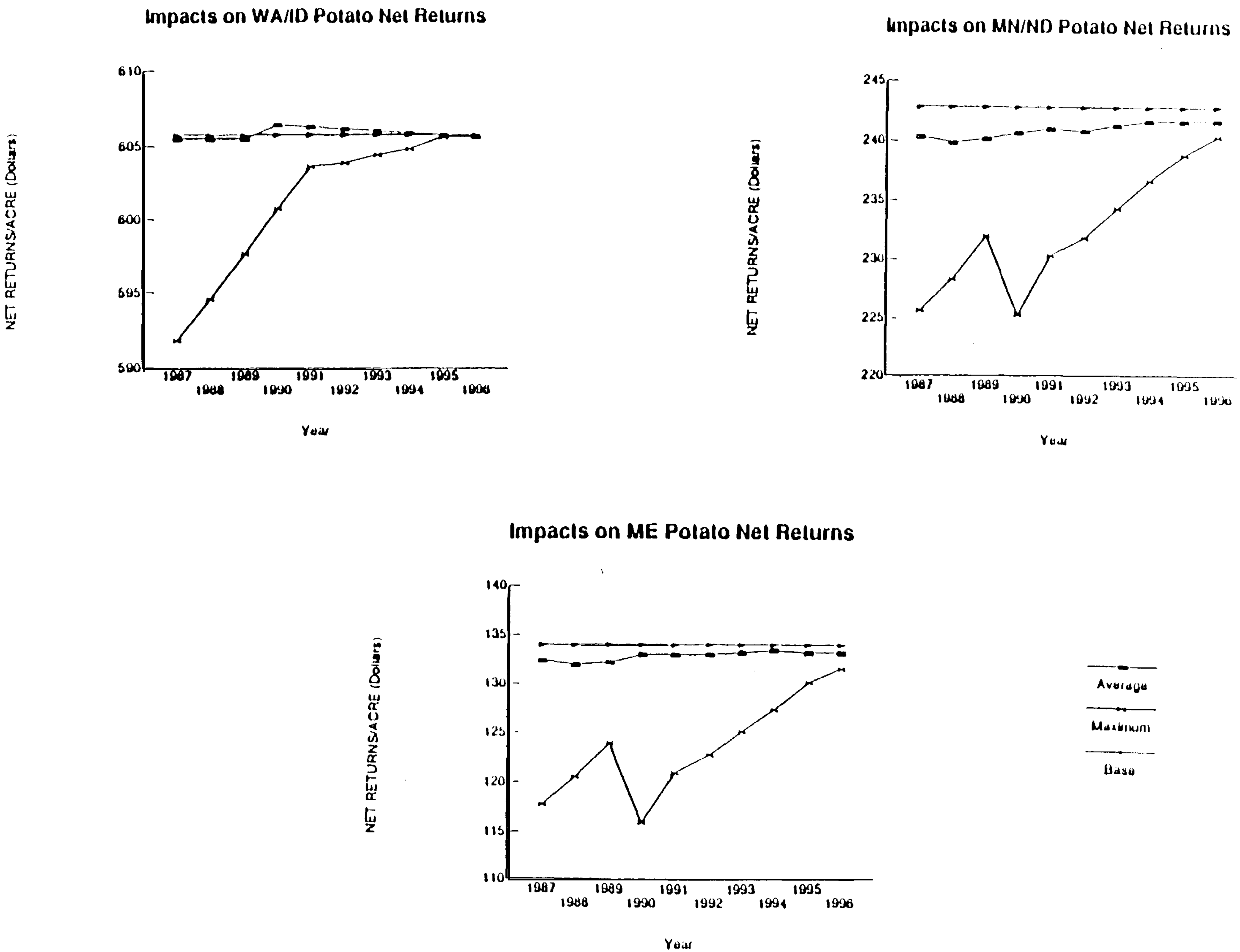
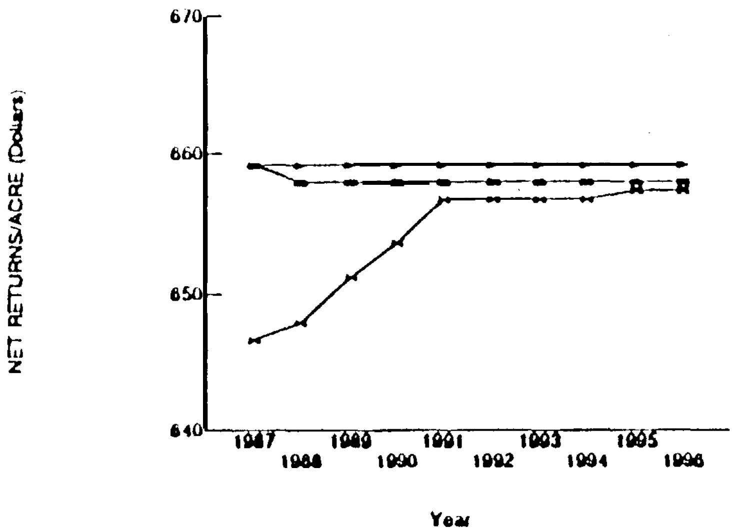
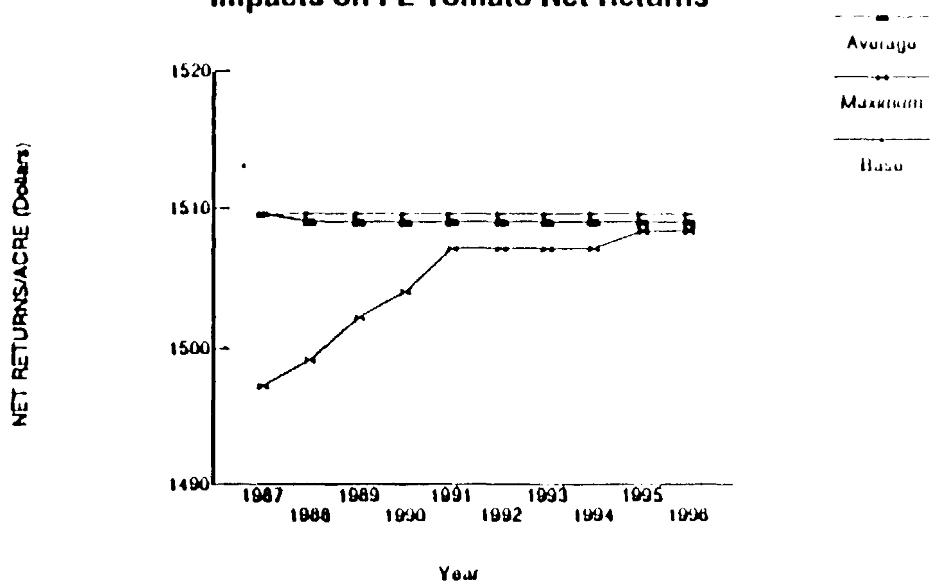


Figure E-2 Scenario regulatory impacts on potato net returns

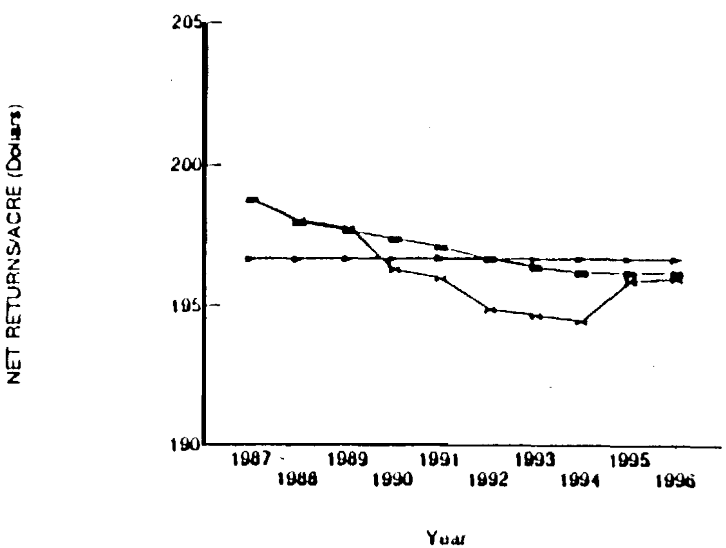
Impacts on CA Tomato Net Returns



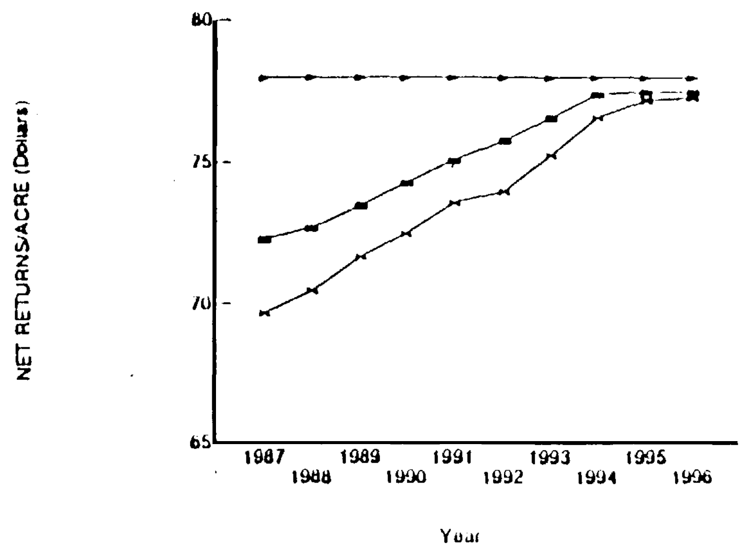
Impacts on FL Tomato Net Returns



Impacts on WI Pea Net Returns



Impacts on WA Pea Net Returns



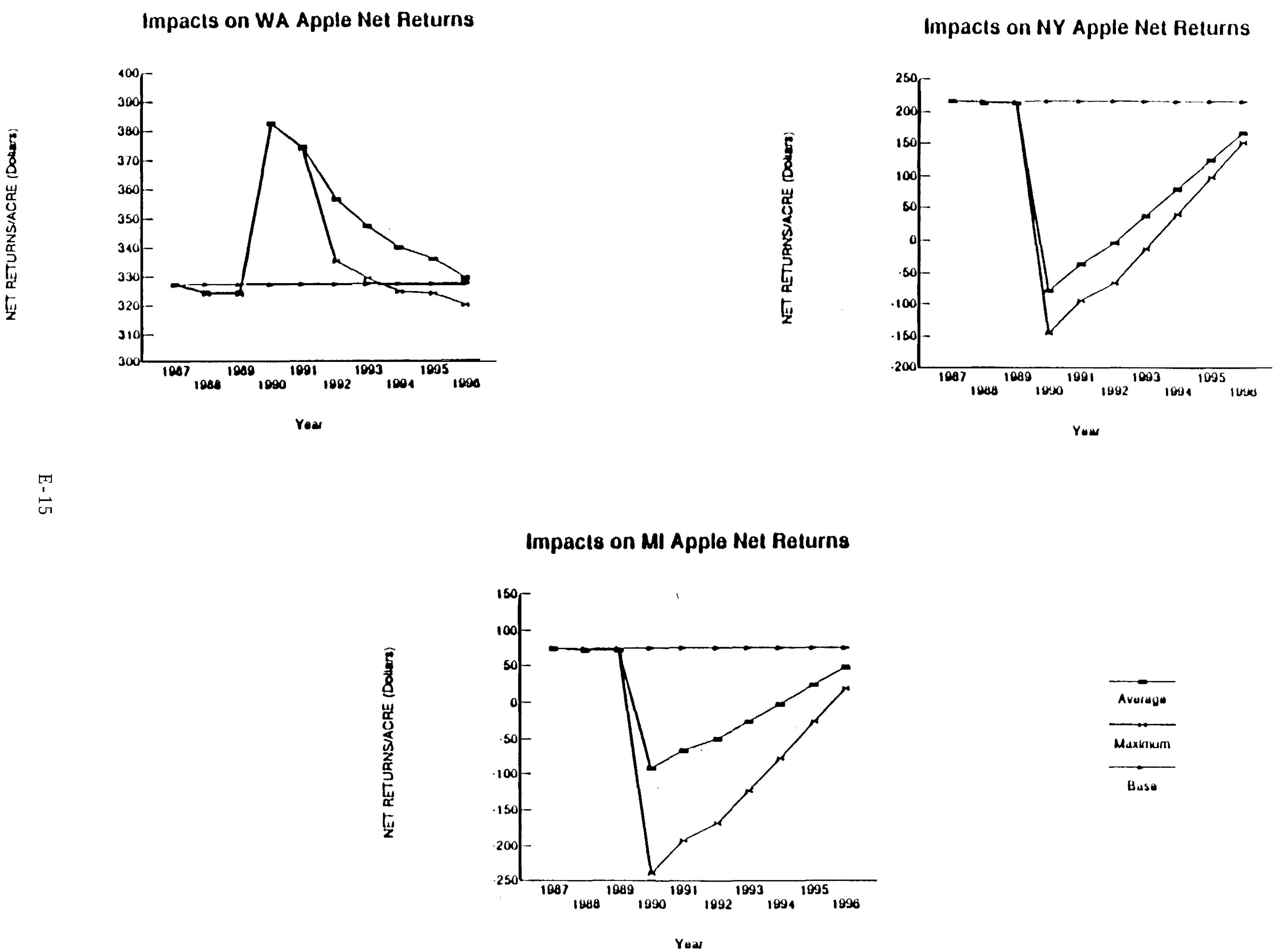
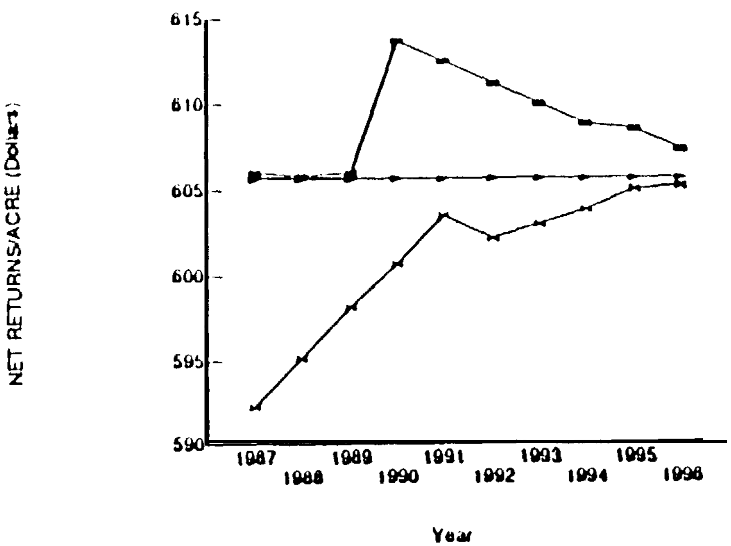
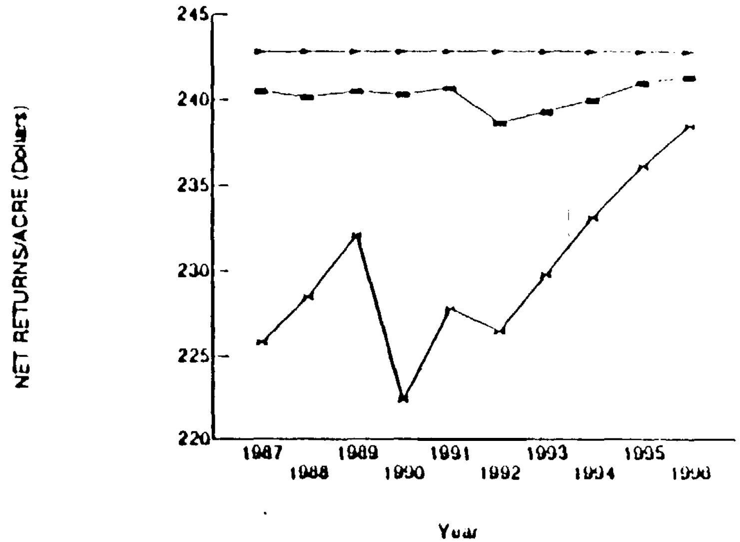


Figure E-4. Scenario 2, regulatory impacts on apple net returns

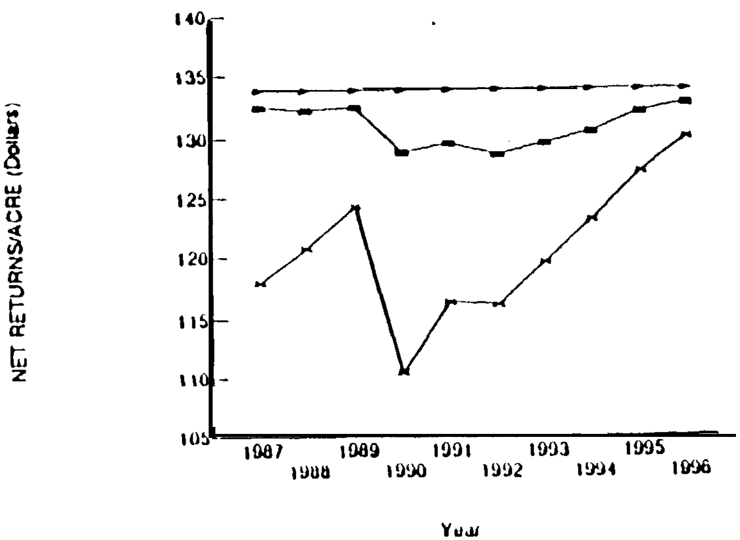
Impacts on WA/ID Potato Net Returns

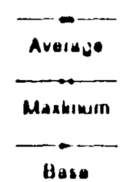


Impacts on MN/ND Potato Net Returns



Impacts on ME Potato Net Returns





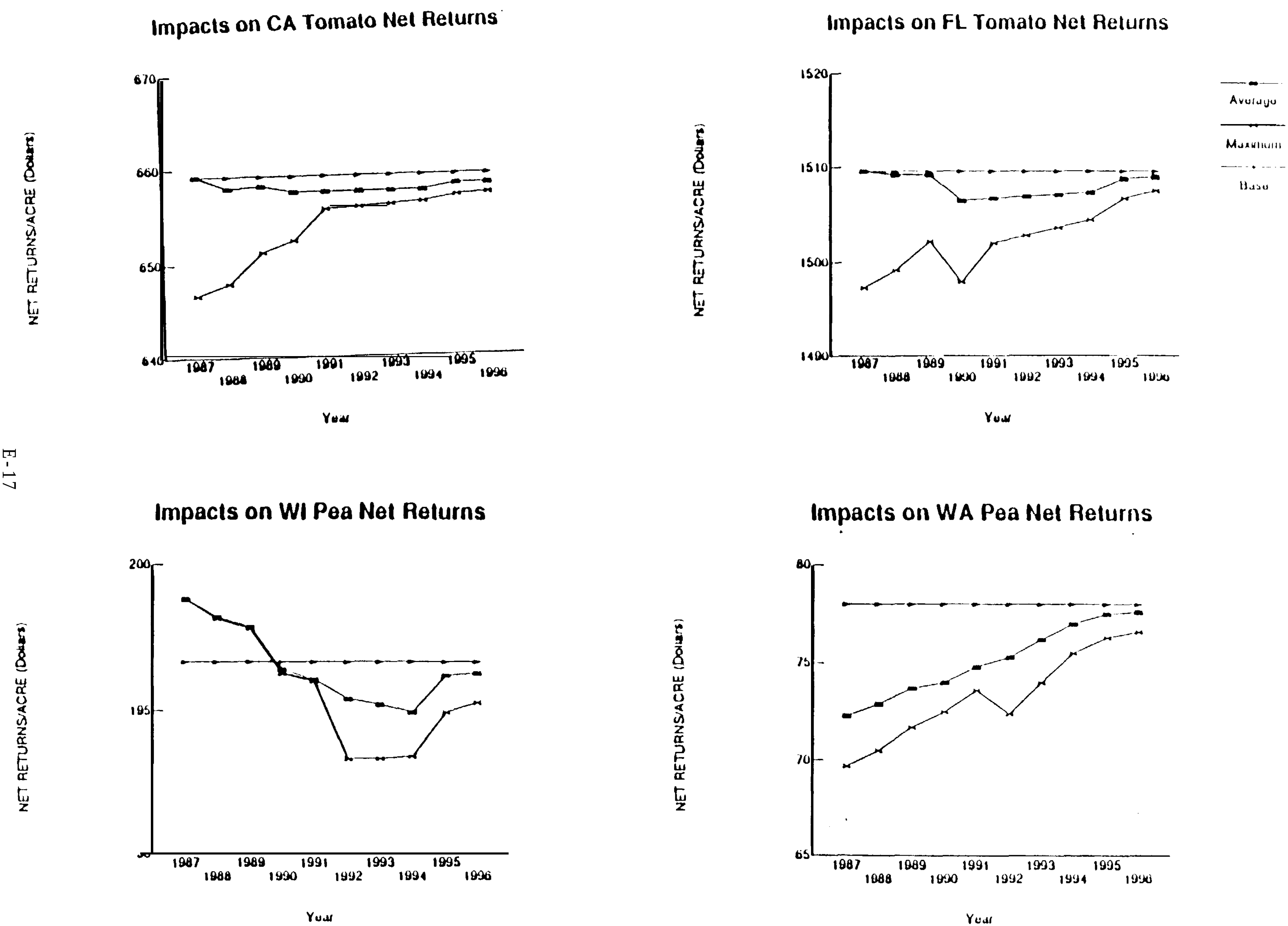
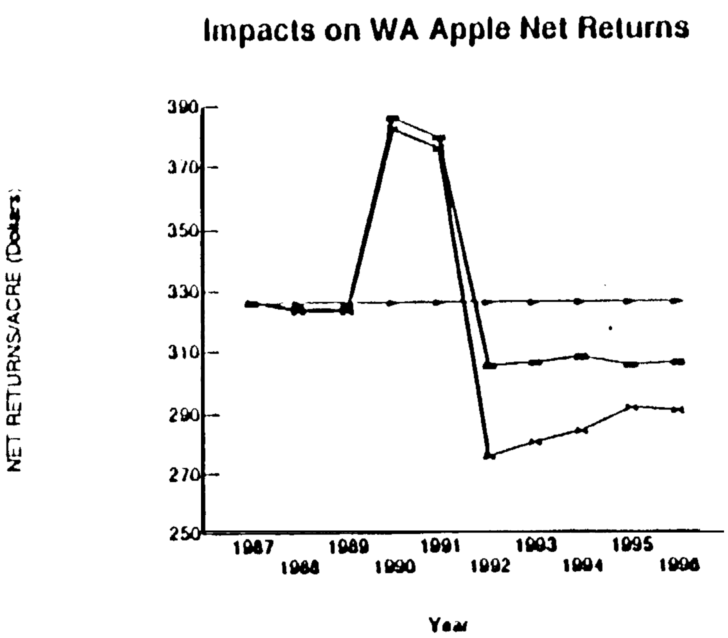
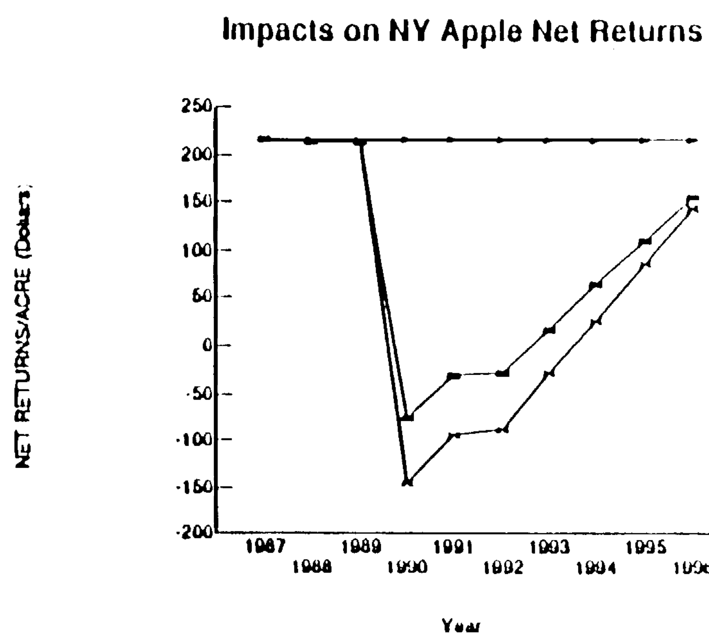


Figure E-6. Scenario 2, regulatory impacts on tomato and pea net retur





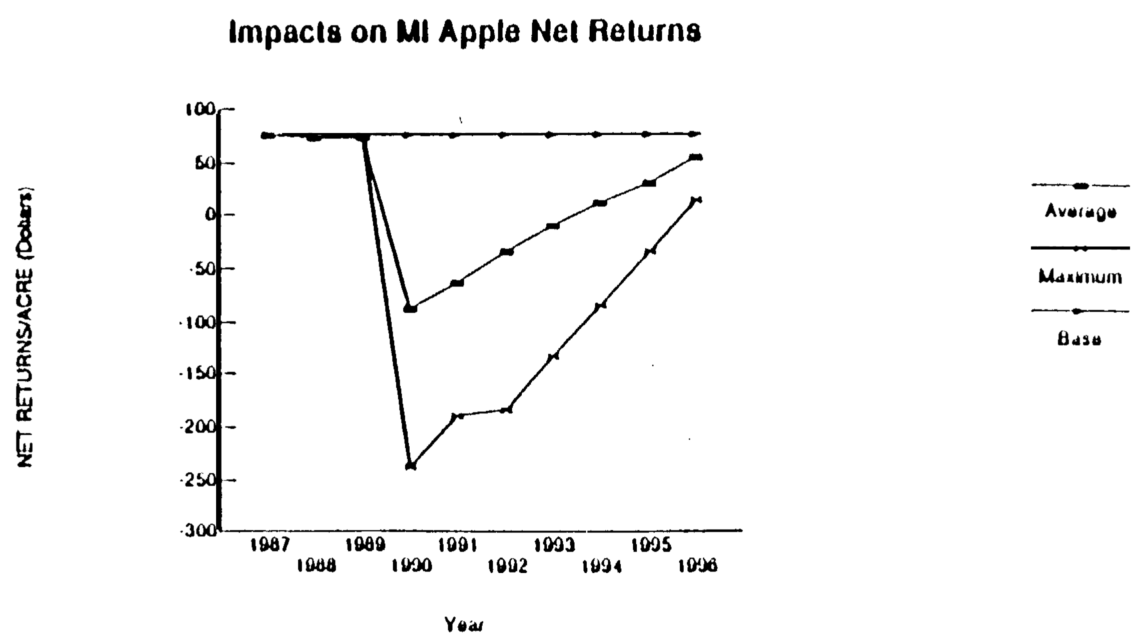


Figure E-7 3, regulatory impacts on apple net returns

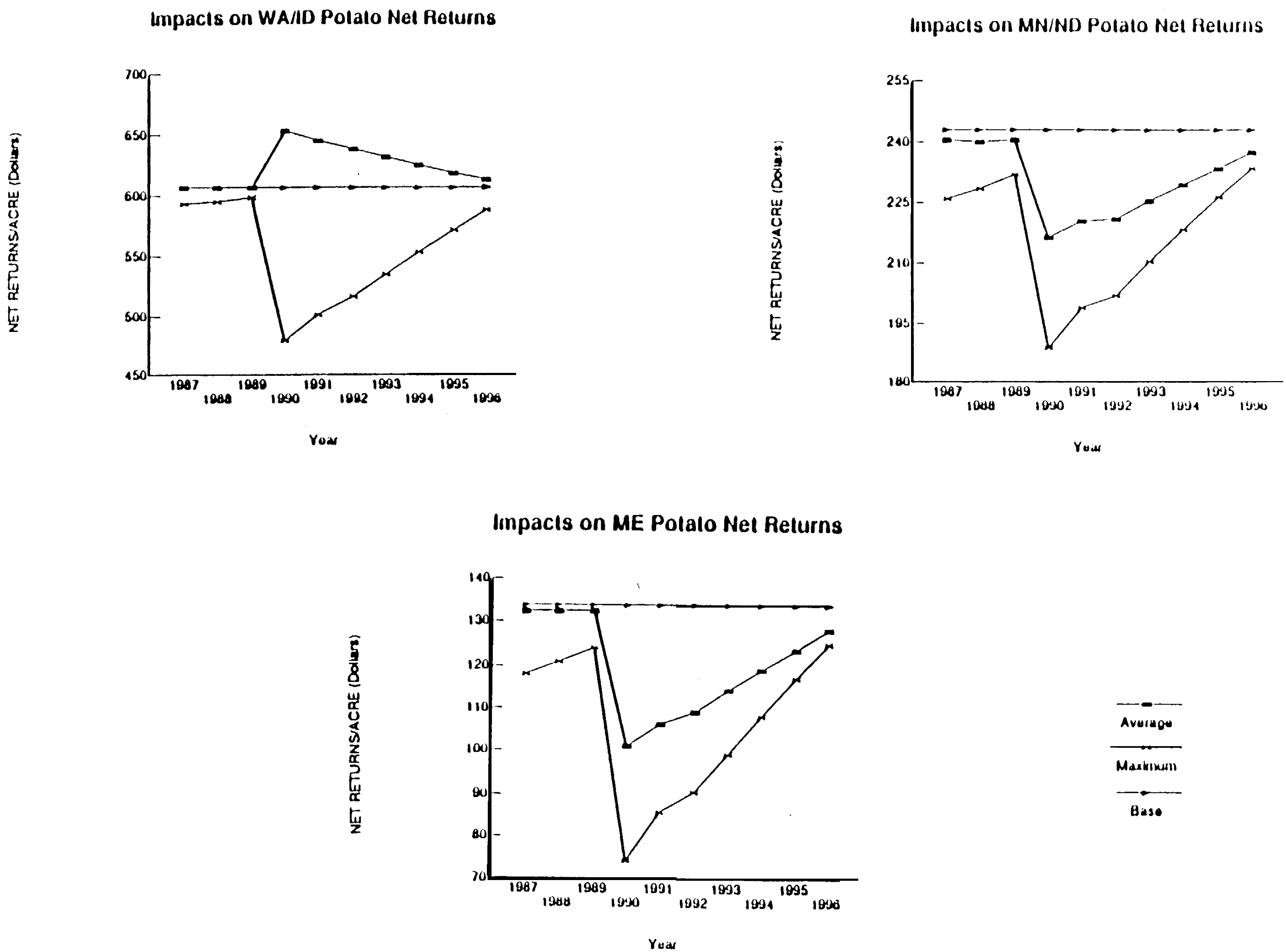


Figure E-8. Scenario 3, regulatory impacts on potato net returns

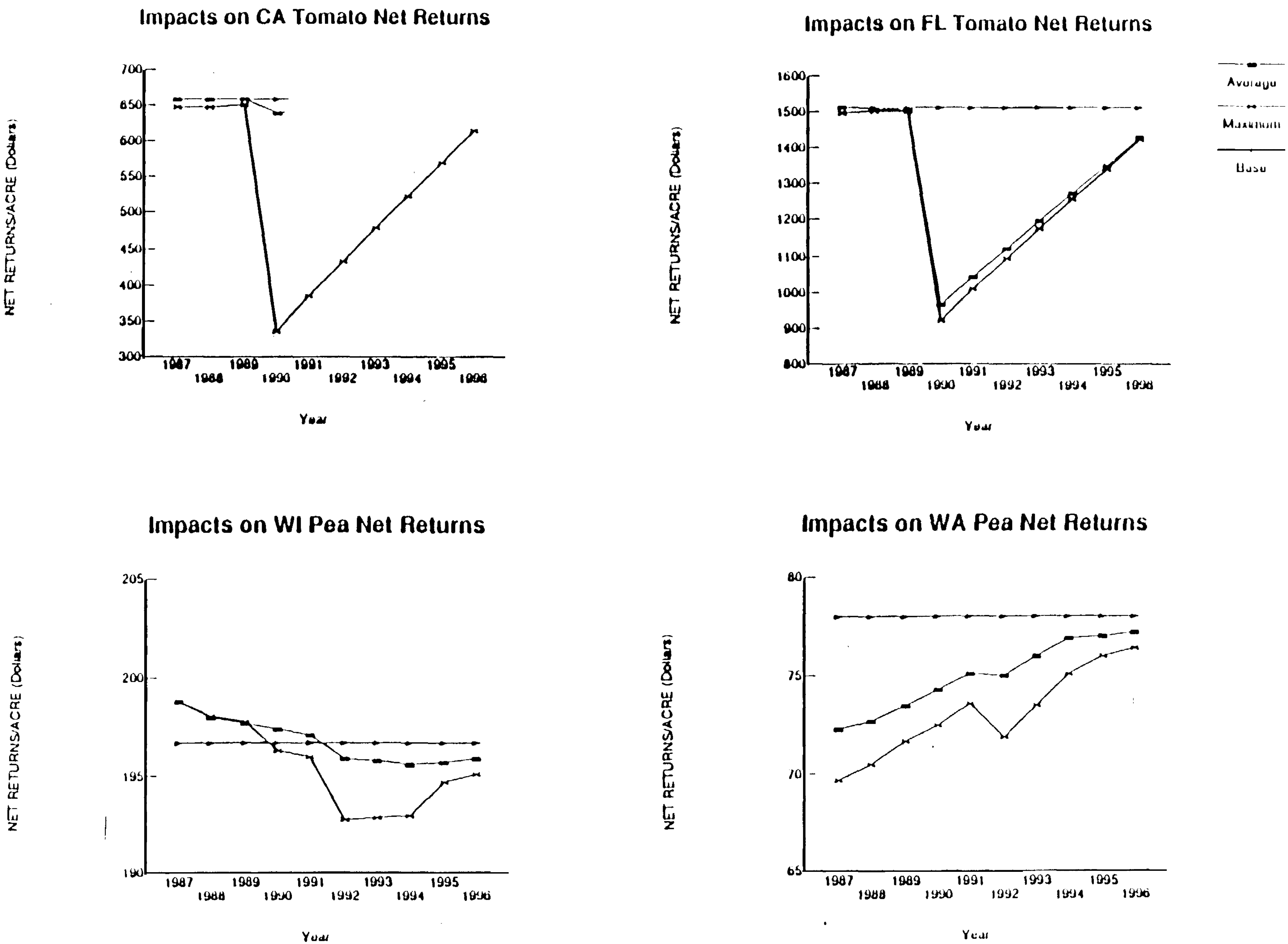


Figure E-9. Scenario 3, regulatory impacts on tomato and pea net returns

APPENDIX F

Data Problems and Assumptions

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Appendix F

Data Problems and Assumptions

The agricultural sector study relied on a wide range of information sources of varying quality. This section summarizes the data sources and briefly discusses the limitations of the data.

1.0 Basic Crop Production Information

Basic crop production data was obtained from annual publications of the USDA National Agricultural Statistics Service (NASS) where data were available. For apples and caneberries there was not a consistent data source. Production and price information for apples was obtained from USDA, while information on acres harvested was obtained from the Bureau of Census. Different estimation techniques were used in these two sources and they were collected in different time periods. However, apples are a relatively slow growing perennial crop, so differences in time frames of a few years are probably not particularly important. There were limited caneberry data available in statistical publications from some important states. The production data sources used in this study are listed below.

A. Crop Production, Annual Summary for relevant years, National Agricultural Statistics Board, USDA.

B. Vegetables, Annual Summary for relevant years, National Agricultural Statistics Board, USDA.

C. 1982 Census of Agriculture, Bureau of Census, USDC.

D. Non Citrus Fruits and Nuts, Annual Summary for relevant years, National Agricultural Statistics Board, USDA.

E. Various state annual reports of agricultural statistics for relevant years.

2.0 Time Frames for Actions

We attempted to project the year in which actions might take place and, for past actions, relied on historical information as to when actions actually occurred. Projections for future actions were based on an examination of likely dates for actions to take place.

For all pesticide specific actions we projected that impacts would dissipate evenly over a seven year period as users adjusted their practices and new pest control products became available.

There is some question regarding the accuracy of this assumption. Clearly, if new technologies exist to ameliorate the impacts of a regulatory action, they would tend to be registered (if necessary and they meet the criteria) and adopted within a seven year period. In addition, the cancellation of a pesticide would create some incentive to replace it. However, there is no certainty that such new technologies exist or if they do not currently exist, would be developed, registered, marketed, and adopted within a seven year time frame. The incentive to develop and market new technologies would tend to be greater for the major field crops, where large potential markets exist. There are also some data which suggest that new pesticides would be more expensive than older ones which have been cancelled.

3.0 Pesticide Usage Data

Quality of pesticide usage data vary widely. There are adequate regional (multi state) level usage data for most major field crops (corn, cotton, sorghum, wheat, and soybeans). Pesticide usage data for barley, oats, and hay are sporadic, with the most recent data being from the 1970's. Therefore, usage estimates developed by the registrants were used for these crops. In general, the usage data bases for major field crops are designed to be statistically reliable at the 10 percent level for the sample region. USDA has on occasion, collected statistically reliable state level data for selected major field crops in selected states.

Specialty crop pesticide usage data are highly erratic. USDA last collected pesticide usage data for tomatoes, green peas, apples, and potatoes in the 1970's. Latest USDA peanut pesticide usage data are for 1982 and there are no data for caneberries. State collected pesticide usage data were utilized when available. However, there are no regular periodic state usage surveys. California collects and reports all pesticide usage for restricted use materials and commercial applicators. This results in usage data which should be very reliable for restricted use materials; but are of questionable usefulness for unrestricted use materials.

The Pesticide Program has access to some proprietary pesticide usage estimates for major field crops and selected specialty crops. However, the reliability of these estimates is largely unknown. For major pesticides on major crops, these estimates agree with available data collected in statistically designed surveys. However, for minor pesticides and specialty crops, usage estimates obtained from proprietary sources are often inconsistent with available statistically designed surveys.

Analysis of the proposed pesticides in groundwater actions required projections of pesticide use at the county level. However, there are no public data collected to be statistically reliable at the county level. Data provided by a contractor was used to predict pesticide usage at the county level. However, this data base is composed of information drawn from available reports and expert opinion or local Cooperative Extension Service personnel and is not based on a statistically valid sample. The Federal government does not have data to check the reliability of any of these estimates.

4.0 Comparative Efficacy and Costs of Alternative Controls

Inputs developed and cleared by the program offices were used for past and near actions. The rigor of these analyses varied considerably. In some instances, potential yield impacts were not investigated and a zero yield loss was assumed. In other situations, rigorous analyses of the magnitude of possible yield losses were available.

In general, available pesticide crop trials are not designed to generate statistically reliable estimates of the differences in yields among substitute chemicals. The objective of the crop trials is to demonstrate that the pesticide provides some control of the pest and not to reveal how pesticides compare with each other.

For actions expected to take place further in the future (generally beyond about one year), various sources of information were employed. The following reports generated by, or for, and cleared by the program offices were used:

Preliminary Benefit Analysis of EDB

Preliminary Benefit Analysis of Toxaphene

Preliminary Benefit Analysis of EPN

Preliminary Benefit Analysis of 2,4,5-T

Preliminary Benefit Analysis of Silvex

Preliminary Benefit Analysis of Carbon Tetrachloride

Regulatory Impact Analysis: Worker Protection Standards for Agricultural Pesticides

Regulatory Impact Analysis in Support of Rulemaking Under Sections 302, 303 and 304 of Title III of the Superfund Amendments and Reauthorization Act of 1986

Regulatory Impact Analysis of Proposed Technical Standards for Underground Storage Tanks

Regulatory Impact Analysis of Proposed Financial Responsibility Requirements for Underground Storage Tanks Containing Petroleum

Preliminary Benefit Analysis of Dinocap

Preliminary Benefit Analysis of Chlordimeform

Preliminary Benefit Analysis of Ethyl Parathion

Preliminary Benefit Analysis of Aldicarb

Abbreviated Benefit Analysis of Dinoseb.

4.1 Corn and Soybeans

Publications from the USDA Commodity Assessment of Pesticide Use on Corn and Soybeans and Potential Bans of Corn and Soybean Pesticides, by Craig Osteen and Fred Kuchler USDA, ERS, Agricultural Economic Report Number 546 as well as some unpublished supporting commodity assessment data information (made available by the USDA) provided comparative efficacy for corn and soybeans. This provided a consistent data base which appears reasonable for the actions proposed for the future. The commodity assessment data base was constructed by obtaining expert opinion of estimates of product cost and yield effects due to losses of pesticides. The USDA has not updated this report and the estimates are somewhat dated. In some cases, the cost of alternatives provided in the Commodity Assessment was not appropriate for this analysis. In these cases the Commodity Assessment was supplemented with information from the Economic Analysis Branch (EAB) price files. Efficacy data for corn and soybeans is probably the most reliable of all crops considered in this analysis.

Concerns about groundwater contamination were assumed to result in the cancellation of both alachlor and the triazines in selected areas. In reality alachlor and the triazines are partial substitutes; however, the Commodity Assessment never considered the question of the loss of both alachlor and the triazines. In the absence of any information on how production costs and yields would change under the cancellation of both alachlor and the triazines, we used the commodity assessment data, which indicate the efficacy information associated with the cancellation of each one, assuming the other remains on the market. Logic indicates that the simple addition of impacts probably underestimated the impact of canceling both, but the degree of underestimation is unknown.

4.2 Remaining Major Field Crops (Wheat, Cotton, Sorghum, Barley, Oats, Hay)

4.2.1 Wheat, Barley, Oats

There was only one significant future action that affected wheat. Yield change estimates developed for EPA by the registrants were used. There was no significant Agency review of these estimates (Benefits Estimates for Maneb, Pennwalt Corporation, December 1987 & Response of the Rohm and Baas Company to the Special Review for EBDC Fungicides, Rohm and Haas Company, October 1987).

4.2.2 Cotton

EPA policy actions assumed in this analysis have potentially significant affects on cotton production. Estimates of impacts were developed rather rapidly using judgments of EAB staff members. Possible actions are in areas where a number of alternative controls exist. Therefore, it is likely that the estimates developed are reasonable.

4.2.3 Sorghum

No efficacy data were available for sorghum. For herbicides it was assumed that the cost and percent yield changes would be the same as those for corn since the crops, pesticides, and pest spectra are similar. This could be a significant limitation since sorghum tends to be grown in drier and warmer areas than corn. The actual performance of the herbicides could be different under these conditions. The impacts of other actions were developed internally based on judgement. Other pesticides are of limited importance in the production of sorghum, therefore, our estimates are probably within reason even though not well documented.

4.2.4 Hay

Possible actions were very limited. Only a small portion of the acres planted are impacted (less than one percent).

4.3 Specialty Crops

4.3.1 Peanuts

Most information for impact estimates for alachlor and aldicarb (groundwater) were available from reports previously cleared by the program office (see above). We estimated portions of acres that would be affected based on knowledge of the soils where the crop is grown. Industry estimates of fungicide cost and yield impacts were used, although they had not been subject to internal review. Insecticide cost and yield effects were developed internally based on information on alternatives and possible target pests. Although we feel reasonably comfortable with estimates for the individual actions, we feel very uncomfortable with the simple addition as a means of aggregating yield impacts across chemicals. This problem, in addition to lack of information on supply elasticities for peanuts, prevented us from providing a complete analysis of the impact of EPA actions on peanut growers.

4.3.2 Apples

Cost and yield impact information provided by industry was utilized for fungicides. Cost information for other pesticides used on apples was estimated internally based on knowledge of registered materials and labeled target pests. Yield impacts were estimated internally based on limited information on yield impacts from selected pesticides.

4.3.3 Potatoes

Aldicarb (pesticide-in groundwater) information was available from an existing Agency study. Fungicide information was available from an industry report submitted to the Agency. Remaining impacts were estimated internally as they were for apples.

4.3.4 Green Peas and Tomatoes

Pesticide industry estimates were available for fungicides. Only limited information (primarily materials registered and target pests) was available to estimate cost and yield impacts associated with other future actions. We had some limited estimates from a contract publication (with no knowledge of how these estimates were obtained) on most common target pests and usage of various materials. Yield and cost impacts were estimated internally with little or no foundation, other than past experience on larger crops.

4.3.5 Caneberries

Virtually no information was available except for pesticide registrations and target pests on labels. This was the situation for most past actions as well as possible future actions. The following informational reports were used:

> Abbreviated Benefit Analysis of Dinoseb (Since the dinoseb action was still in litigation at the time inputs were developed for the study, estimates of impacts as developed for the regulatory action were used for this analysis).
>
> Preliminary Benefit Analysis of Aldicarb
>
> Preliminary Benefit Analysis of Alachlor
>
> Regulatory Impact Analysis: Registration fees under FIFRA

Regulatory Impact Analysis: Data requirements for Registering Pesticides

Benefit Estimates for Maneb, Pennwalt Corporation, December 1987

Response of the Rohm and Haas Company to the Special Review for EBDC Fungicides, Rohm and Haas Company, October 1987.

5.0 Elasticities

Price elasticities used for the major field crops were those contained within the simulation model (AGSIM). While the estimated elasticities may be subject to criticism, they were generated in a consistent manner within the same model. Price elasticities for the specialty crops were short-run farm level elasticities and were obtained from whatever reasonable sources were available. These estimates of supply and demand elasticities may have been estimated from different data bases using different techniques.

5.1 Apples

Obtained elasticities of supply from a USDA/ERS report "An Econometric Model of the U.S. Apple Market," June 1985. Elasticity of demand estimates from K. Huang, USDA/ERS, 1985.

5.2 Caneberries

Estimates of elasticities were not found.

5.3 Peanuts

Discussions with economists familiar with peanut production (both with USDA and in major peanut production areas) indicated that there are no reasonably reliable peanut elasticity of supply estimates available. Elasticities of demand are from K. Huang, USDA/ERS. However, these are questionable due to the nature of perceived demand for domestic peanuts produced under quota and additional peanuts (peanuts for export and oil).

5.4 Peas, Potatoes and Tomatoes

Elasticities of demand were obtained from K. Huang, USDA/ERS, 1985. Elasticities of supply for peas were obtained from Ascari and Cummings, International Economic Review, 1977. Elasticity of supply for potatoes was obtained from unpublished work by G. Zepp, USDA/ERS, 1987. Elasticity of supply for tomatoes was obtained from Churn and Just, Giannini Monograph, 1978.

APPENDIX G

Cumulative Probability Cost Distribution

By

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Appendix G

Cumulative Probability Cost Distribution

Since we are simultaneously examining the impact of several EPA policies, a fundamental issue that had to be determined was: how do we define an “impacted” farmer? For example, Illinois corn soybean farmers may be affected by the cancellation of several different pesticides, may incur insurance costs if they have an underground storage tank that meets certain criteria, and may incur an expense to rebuild their tractor engine if all lead is banned from gasoline and they have a leaded gasoline tractor. How many of these potential costs do we assume that the “impacted” farmer incurs? For each producer we examine two alternative sets of impacts:

* A Maximum Impact Case: In this case it is assumed that the producer is affected by every regulation that may possibly affect a producer of that type.

* An Average Impact Case: In this case it is assumed, that the producer experiences the average impact of producers-of that type - e.g., if 10% of all-producers of a given type experienced a cost of $1,000, we would use a cost of $100 ($1,000 x 0.10) for the average impact case.

Examining these two cases, however, only provides two snapshots of possible impacts without providing the full picture of how cost and yield impacts are likely to be distributed across producers. To provide more insight into the likely distribution of these initial cost and yield impacts, we constructed a cumulative probability cost curve for each representative farm in average financial position. The following example demonstrates what these cumulative probability cost curves reveal.

Suppose a given farmer may be affected by three possible regulations, each having the following associated cost and probability of affecting a given producer:

Regulation	Cost	Probability of Impact	Probability of No Impact
A	$100	.30	.70
B	$200	.20	.80
C	$300	.10	.90

Provided the probabilities of incurring the costs of the three regulations are independent, the possible set of outcomes and associated costs and probabilities may be defined as:

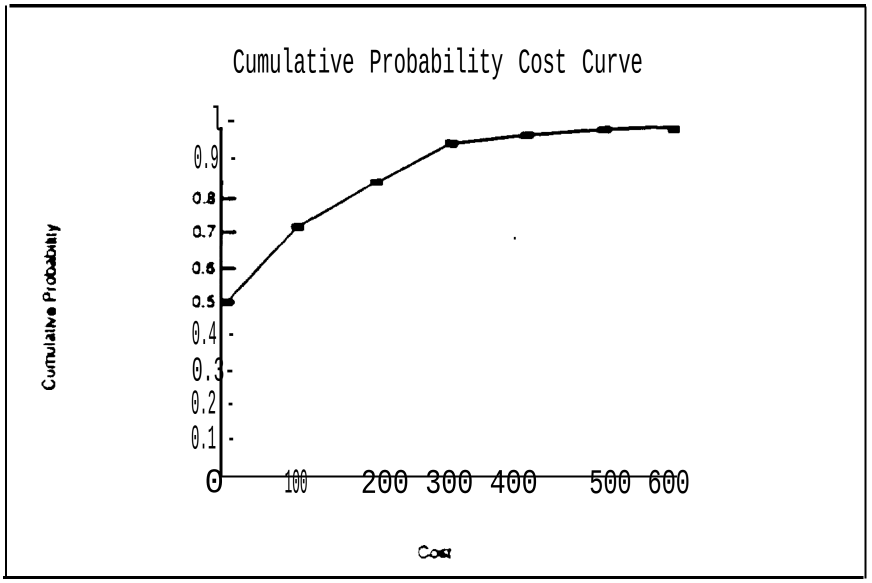
Regulations Affected by:	Cost	Probability 1/
A	$100	.2 1 6
B	$200	.126
C	$300	.056
NONE		. 504
A,B	$300	. 054
B,C	$500	.014
A,C	$400	.024
ALL	$600	. 006

1/ Note the probability of being impacted by Regulation A = P(A) x P(NB) x P(NC), where P(A) = the probability of being affected by regulation A, and P(NB), P(NC) = the probability of not being affected by B and C, respectively.

By ranking these possible outcomes in order of cost, and adding up the associated probabilities, we can arrive at the following cumulative probabilities:

Regulations Affected by:	Cost	Cumulative Probability
NONE	$0	.504
A	$100	.720
B	$200	.846
C	$300	.902
A,B	$300	.956
A,C	$400	.980
B,C	$500	.994
ALL	$600	1.00

Then, plotting the cost on the x-axis and the cumulative probability on the y-axis, we can use this information to generate the following cumulative probability cost curve:



This cost curve indicates the probability of incurring a cost <u>less than or equal</u> to a given level. For example, it indicates that any given farmer has a probability of .846 of incurring a cost that is less than or equal to $200.

To shed insight into the probability that the farms examined in this report would actually incur any given level of cost, we generated a cumulative probability cost curve for each of the representative farms in average financial position. In the above example, all of the costs were assumed to be independent. In reality, however, this may not be the case. For example, farmers who use a certain type of pesticide on their corn may very likely be using the same pesticide on their soybeans, if the pesticide is used on a certain pest that is found on both corn and soybeans. In generating the cumulative probability cost curve for each representative farm, we tried to account for the correlation among different costs. The assumptions we used for each representative farm are outlined below:

Illinois corn soybean farm assumptions:

1. If a farmer is using any chemical, then he incurs Farm Worker Safety Costs.
2. If a farmer is using alachlor on his soybeans, then he is using alachlor on his corn.
3. If a farmer is using a corn rootworm insecticide on his corn, then he is using a triazine on his corn.
4. If a farmer is using alachlor on his corn, then he is using a triazine on his corn.

Mississippi cotton soybean farm assumptions:

1. If a farmer is using any chemical, then he incurs Farm Worker Safety Costs.
2. If a farmer is using dinoseb on his soybeans, then he is using dinoseb on his corn.

Kansas wheat cattle farm assumptions:

1. If a farmer is using any chemical, then he incurs Farm Worker Safety Costs.
2. If a farmer is using alachlor on his soybeans, then he is using alachlor on his corn.
3. If a farmer is using a triazine on his corn, then he is using a triazine on his sorghum.
4. If a farmer is using alachlor on his corn, then he is using a triazine on his corn.

Incorporating these assumptions into the method described in the above example, we generated a cumulative probability cost curve for each representative farm in each scenario (Figures G-l-through G-5). Any given point on the curve may be interpreted as the

ILLINOIS CORN SOYBEAN FARM: SCENARIO 1
AVERAGE FINANCIAL POSITION

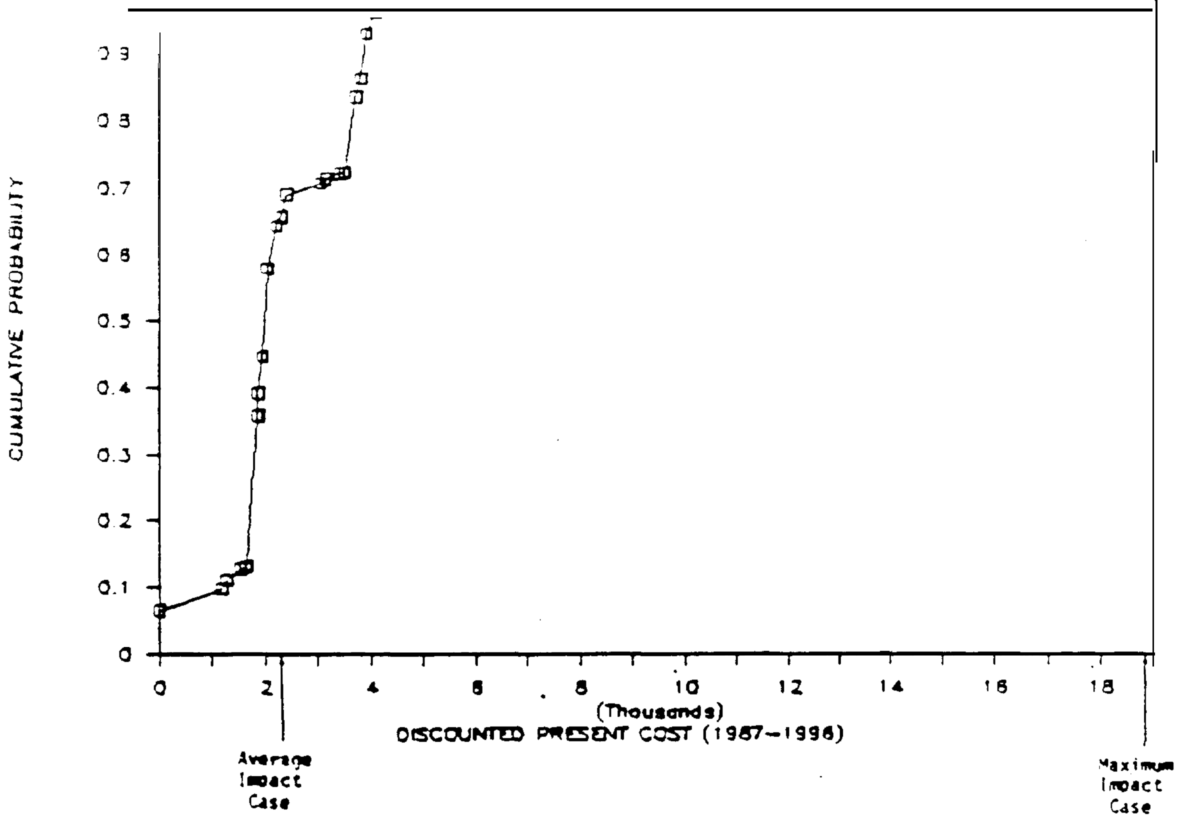


Figure G-la. Scenario 1, cumulative probability cost curve for the representative Illinois corn soybean farm in average financial condition

ILLINOIS CORN SOYBEAN FARM: SCENARIO 2
AVERAGE FINANCIAL POSITION

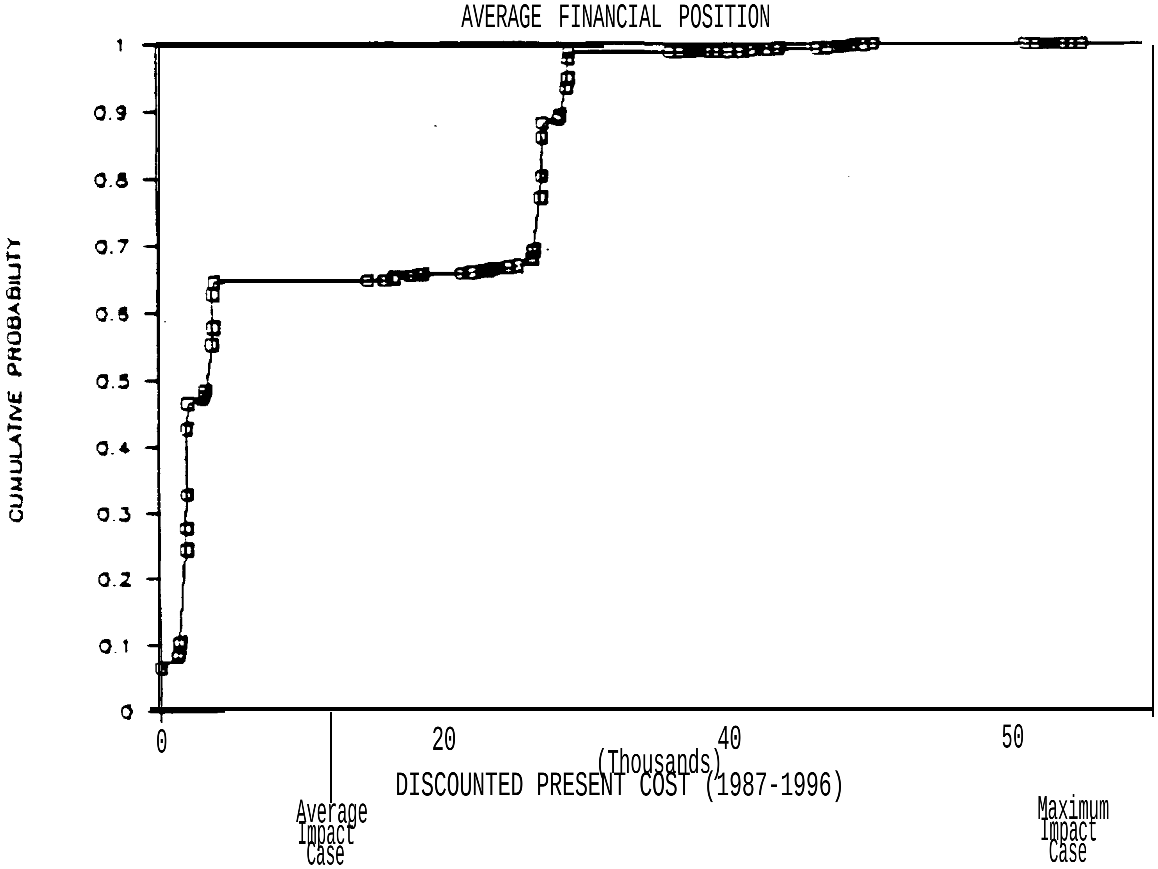


Figure G-lb. Scenario 2, cumulative probability cost curve for the representative Illinois corn soybean farm in average financial condition

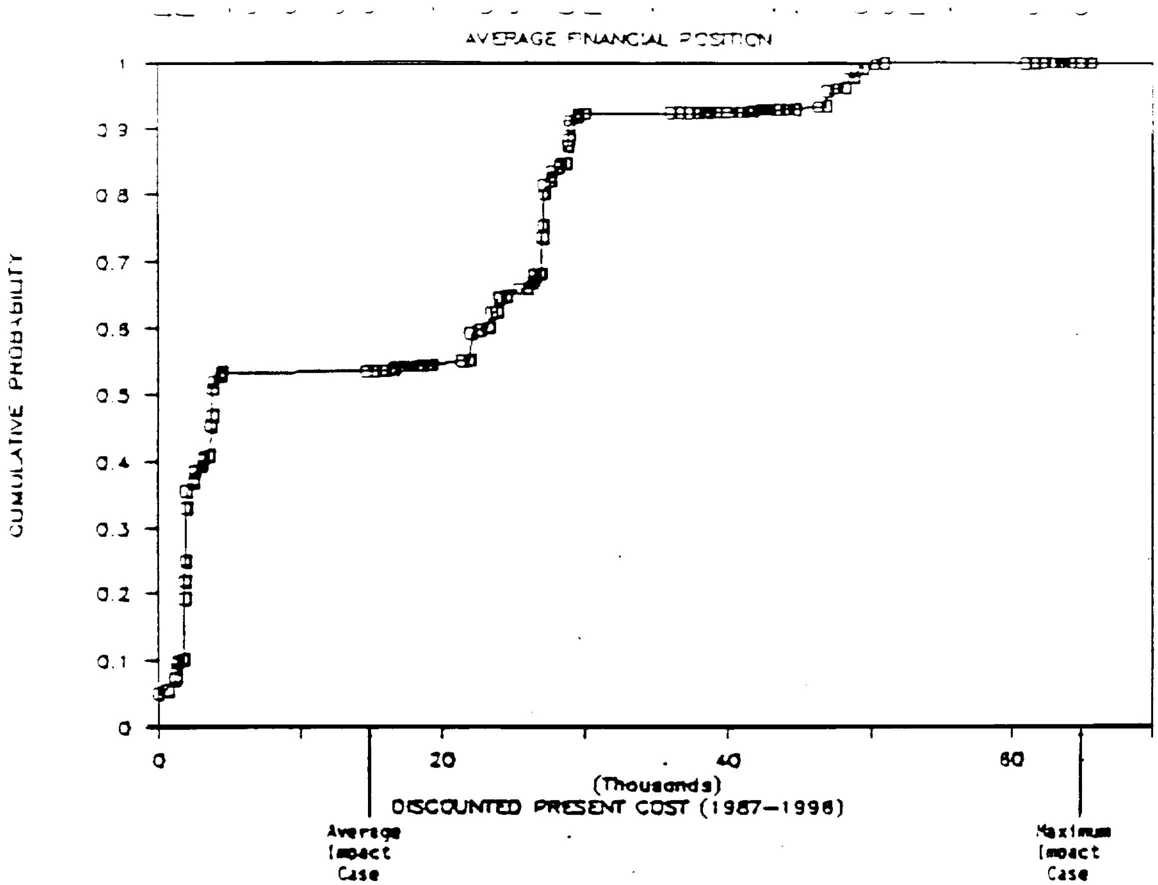


Figure G-2a. Scenario 3, cumulative probability cost curve for the representative Illinois corn soybean farm in average financial condition

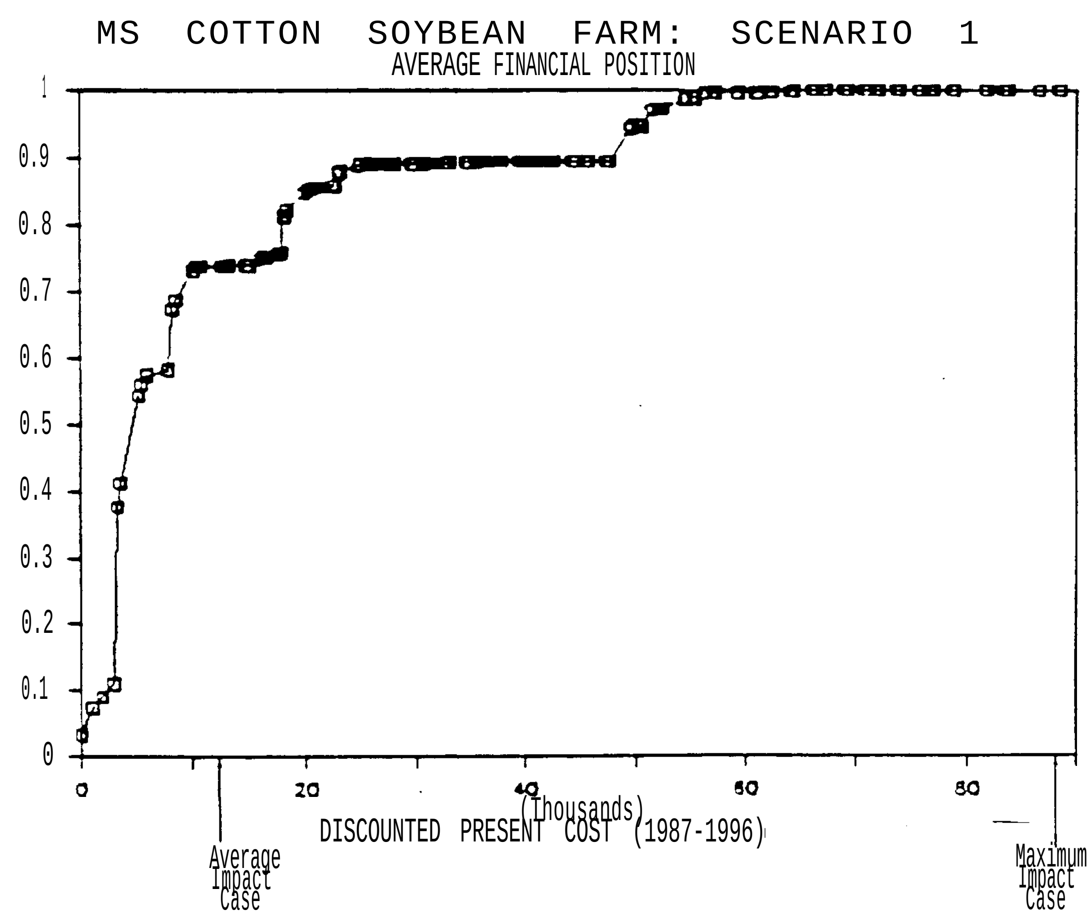


Figure G-2b. Scenario 1, cumulative probability cost curve for the representative Mississippi cotton soybean farm in average financial condition

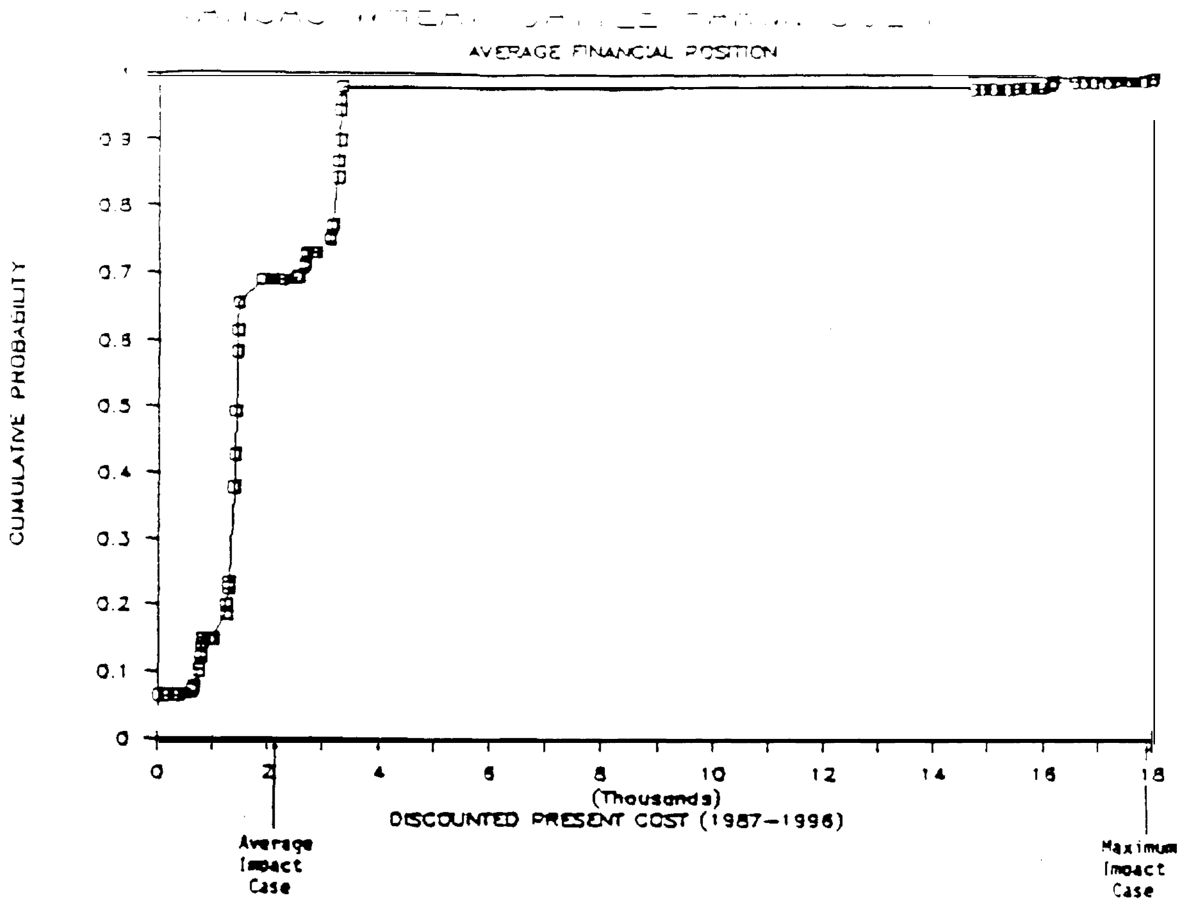


Figure G-La. Scenario 1, cumulative probability cost curve for the representative Kansas wheat cattle farm in average financial condition

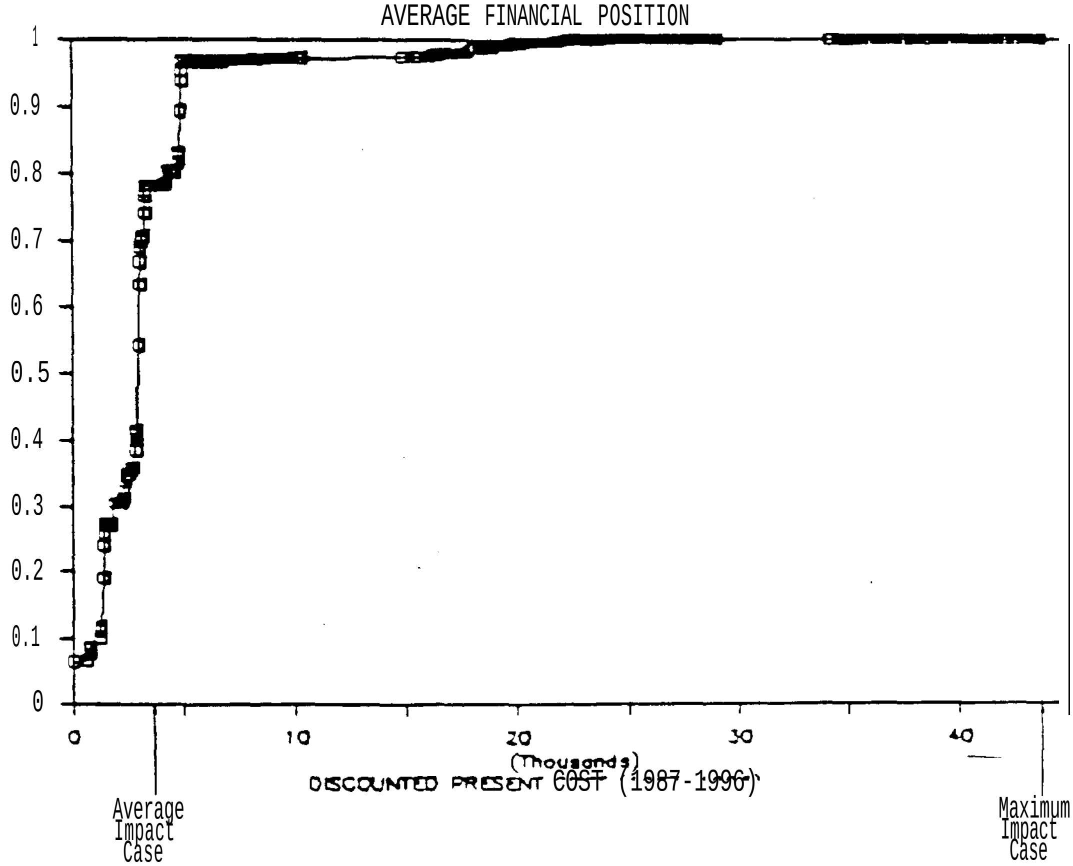


Figure G-4b. Scenario 2, cumulative probability COSt curve for the representative Kansas wheat cattle farm in average financial condition

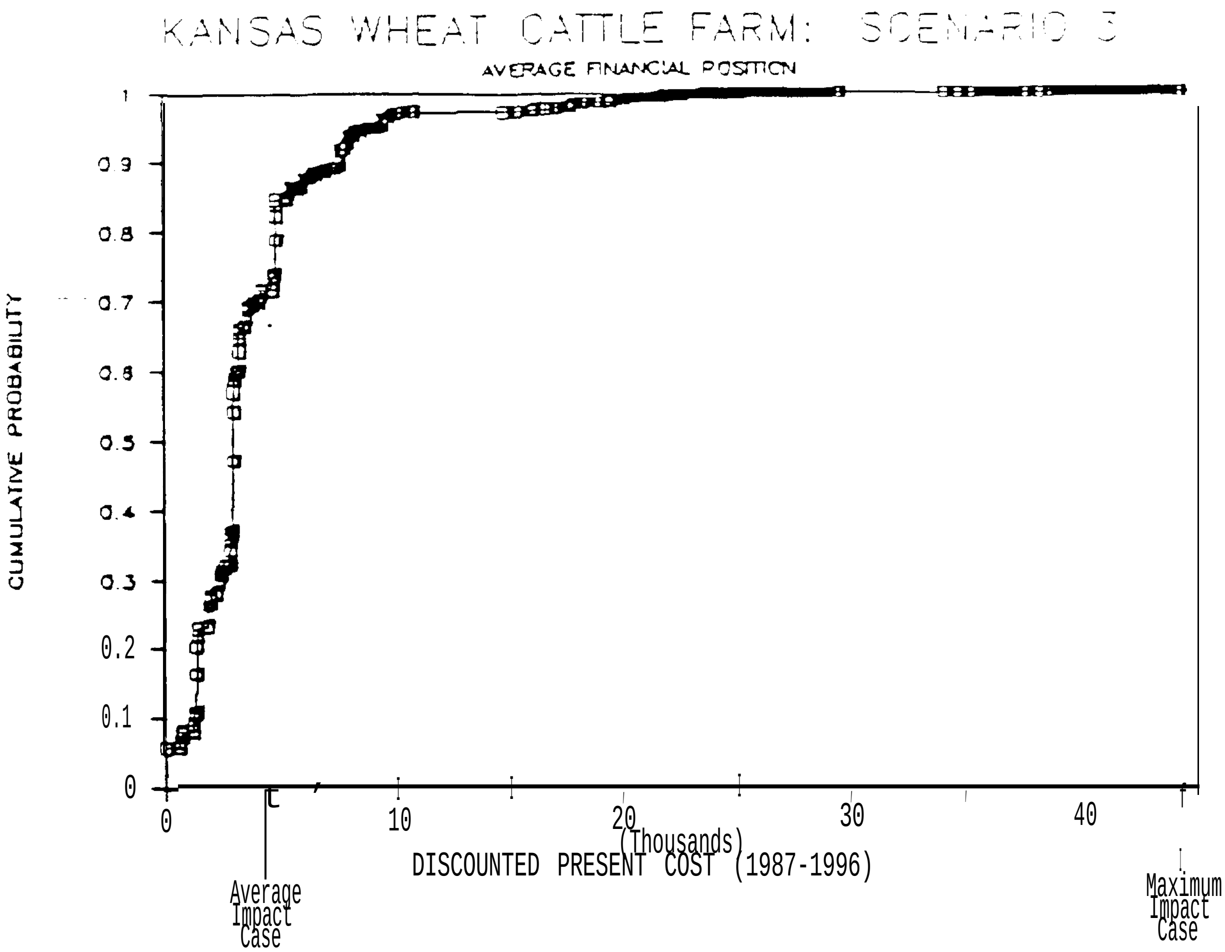


Figure G-5a. Scenario 3, cumulative probability cost curve for the representative Kansas wheat cattle farm in average financial condition probability that the representative farm will incur a cost equal to or less than a given level. For example, the curve in Figure G-la indicates that the representative Illinois corn soybean farm in Scenario 1 has a .50 probability of incurring a discounted present value of cost and yield impacts (1987-1996) of less than or equal to $2,000. The discounted present value of cost and yield impacts corresponding to the average and maximum impact cases are indicated on each curve.

If all Illinois corn soybean farms had the same number of acres of each crop as the representative farm, Figure G-la could be interpreted as the percent of farms likely to incur cost and yield impacts less than or equal to a given level. Since farms will vary in the number of crop acres that they plant, their present discounted value of impacts under any particular combination of regulations will vary from the representative farm. (Recall that the representative farm does not truly represent all farms but is only a composite of farms of a given type.) These curves, therefore, are only meant to provide some insight into the distribution of cost and yield impacts for farms of a given type but do not represent accurate cost and yield impacts for any particular farm (other than the average farm), or the true distribution of impacts across farms.

APPENDIX H

Recommendations for Acquiring Better Pesticide Usage Data

By

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Appendix H

Recommendations for Acquiring Better Pesticide Usage Data

In this agricultural sector study, the lack of current and reliable pesticide usage data has limited the ability to accurately assess the economic impact of EPA actions, particularly on the specialty crops. The quality of the usage data used in the report is described in Appendix F. To summarize, data for the major crops were usually adequate only at the regional level. For small-area crops, the data were old and/or of unknown statistical validity. For no crop was information available nationwide at the county level which is the minimum level of disaggregation needed for measuring the impact of ground water regulatory actions. The gaps identified in Appendix F could affect the study results because the measurement of economic impacts of EPA actions depends on the cost and yield effects of pesticide cancellation which in turn depend on usage data.

The agricultural sector study is only one example of the many EPA analyses that depend on basic pesticide data for accurate estimation of economic and other effects of pesticide regulation. Because this study is an excellent illustration of the difficulty the data limitations present, it is an opportunity to discuss those limitations, their consequences for economic and risk analyses of pesticide use, and what can be done to improve the situation.

As seen in the agricultural sector study, two types of basic pesticide data are fundamental to assessing a pesticide's economic importance: performance and usage. A current project in the Office of Pesticide Programs directly addresses the incompleteness of the performance data by strengthening data requirements placed on pesticide manufacturers. For that reason, the discussion here is limited to usage data, defined roughly as the amount a particular pesticide and its alternatives are used on a crop, how many acres are treated with each pesticide, in which locations, at what rate, and by what methods. For the sake of brevity, the focus is on agricultural pesticide use, although data problems exist with nonagricultural use as well.

1.0 Why Pesticide Usage Data are Important

The agricultural sector study is just one of several recent special analyses relying on pesticide usage data. Some of the special studies could be of far-reaching importance for future pesticide use, for example, preparation for the Agency's Endangered Species Program and targeting of water wells for the national groundwater monitoring program. For risk/benefit analyses on individual pesticides and for other regular pesticide assessments (e.g., exemptions for local use), usage data and performance data form the foundation upon which scientists and economists build their quantitative estimates of a pesticide's importance.

Without complete information, often the case with small area crops, analysts must rely on educated guesses, adding uncertainty to their final conclusions. In the recent case of the herbicide dinoseb, usage information on alternatives was not readily available and analysts had inadequate time to gather it.- This lack of data contributed to a successful legal challenge by growers of some small crops, causing EPA to exempt those crops from the suspension decision already made. Furthermore, usage data are an integral part of exposure assessments, which in turn play a key role in deciding whether a pesticide is placed in Special Review.

2.0 Current State of Usage Data

The agricultural pesticide usage data currently available are very uneven in quality and coverage. For the major crops such as corn, soybeans, cotton, and wheat, current survey data are available from USDA and private sources and are likely to be collected periodically in the foreseeable future. Information on major crops falls short of OPP's needs because it often excludes minor producing areas and are often not disaggregated to a small enough geographic level. Considerably greater problems occur with small-area crops, for example, there has been no publicly-available survey of pesticide use on citrus since 1977. For the specialty crops studied in this report as well as the whole spectrum of fruits, vegetables, and other crops, usage data are rarely what they need to be: current, reliable, disaggregated at least to the state level, and publicly available.

3.0 Recommendations for Acquiring Better Data

The Benefits and Use Division (BUD) of the Office of Pesticide Programs has made a concerted effort to upgrade its usage data, but is often met with budgetary constraints. BUD recently estimated that it would cost $3 million to acquire adequate survey usage data on crops and nonagricultural sites of importance to OPP. That expenditure would be needed every three or five years.

However, the Office of Pesticide Programs is not the only organization needing pesticide usage data, and the list is growing because of heightened concern about pesticide health and environmental effects, for example groundwater contamination. Other organizations which recently used pesticide usage data are:

* Department of Agriculture,
* EPA Office of Drinking Water, Non-Point Source Branch,
* EPA Office of Ground Water Protection,
* individual registrants,
* Food and Drug Administration,
* National Agricultural Chemicals Association,

* state environmental, water quality, and public health programs, and
* U.S. Geological Service, Water Resources Division.

For some of the options that follow, a cost-sharing arrangement between EPA and other interested organizations could make the data acquisition far more affordable.

Below are possible options for generating better pesticide usage data. Each has different costs and benefits.

1. Conduct a set of jointly-funded periodic surveys of pesticide users

   Each set would cover certain sites, such as major crops, small area crops, crops in certain regions, pesticide-intensive crops in areas of groundwater vulnerability, or nonagricultural sites. A different group of sponsoring organizations would fund each set. Fees would be charged to non-sponsoring users.

2. Set up cost-sharing between EPA and states to conduct surveys

   This is a more limited version of option #l. In-order to receive EPA funds, states would have to design the surveys to meet certain specifications so the data. would fit EPA's needs. This might be the most efficient approach for small crops.

3. "Socialize" private data collection services
   These services currently poll farmers nationwide on pesticide usage. EPA and-other interested parties could contract to completely fund the data collection, in order to be able to control the survey methods and site coverage; and to ensure the data is public.

4. Attach questions to existing USDA surveys currently used for other purposes

   This is already being done to a limited extent; the new questions would be much more detailed.

5. Attach questions to the U.S. Census of Agriculture

   The Census currently asks farmers questions on all crops as well as usage of pesticide in broad categories. To be useful for most EPA analyses, additional questions would be added that are detailed at the active ingredient level.

6. Require data from registrants

Registrants are required to generate pesticide toxicity and performance data to support pesticide registrations. If usage data were also required, the cost to the government would be lower than with other options, though there could be problems with confidentiality.

7. A combination of the above

Existing USDA surveys cover only a subset of the crops relevant to EPA. Pesticide usage questions, could be attached to those surveys while data on remaining crops could be collected jointly by a consortium as in #l and #3.

An interagency committee composed of EPA, USDA, FDA, and DOI, meets on occasion to share pesticide usage data. To date, there has been no joint funding of data. Working through the committee, the OPP Benefits and Use Division and the OPPE Office of Policy Analysis have begun an initiative to acquire better data.

4.0 Summary

There is a clear need for more detailed, precise estimates of pesticide usage, both agricultural and non-agricultural. Recent renewed interest in pesticide-related environmental and health problems has increased the number of organizations needing such information. Because there are many hundreds of different pesticidal active ingredients and hundreds of different crops and nonagricultural sites across the country, acquiring high quality information on a regular basis is expensive. Yet without it, the accuracy of economic valuation of pesticides is uncertain. If such accuracy is deemed important enough, some increased effort will be needed to acquire the necessary data.

There are several ways to generate better usage data. Detailed questions could be attached to existing surveys designed for other purposes, EPA could require the data from registrants, or a consortium of interested private, federal, and state organizations could be formed to share the costs of new surveys. Since there is a wide variety of use sites, a different arrangement might be made for different types of sites.

Each approach would differ from a cost-benefit standpoint. To the extent EPA can pool resources with other users of pesticide data, costs can be lowered. The benefit of better data will be greater efficiency in the assessments of pesticide use, a higher quality of analysis, and subsequently, more informed decisions on pesticide regulation.